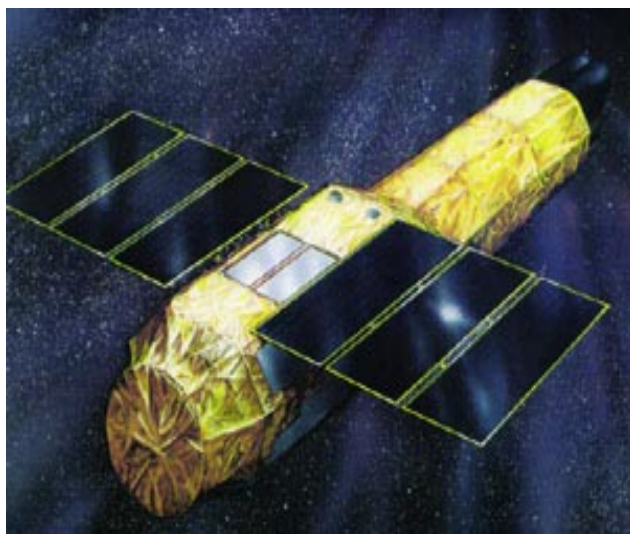




ASTRO-E



Artists conception of the ASTRO-E satellite

Mission Overview

ASTRO-E is a joint Japan-U.S. satellite mission devoted to the study of celestial x-ray sources, such as the regions very close to black holes and the ultra-hot gas in the vast spaces between galaxies. The long-awaited mission, the fifth in a series of Japanese-led x-ray astronomy missions, will showcase an entirely new technique in x-ray detection that promises a ten-fold increase in resolution over current satellites. The launch is planned for February, 2000.

ASTRO-E mission complements NASA's Chandra X-ray Observatory, launched in 1999. Whereas Chandra excels in capturing images of x-ray sources, ASTRO-E captures the spectrum of these sources. A spectrum contains information about the composition, temperature, velocity and direction of the gas that is emitting the x-ray light. ASTRO-E will provide detailed spectra of supernova remnants; black-hole-powered quasars and active galaxies; the corona of stars 10,000 times brighter than the sun; and galaxy clusters, the largest known structures in the Universe.

Previous Japanese missions in this series are Hakucho, Tenma, Ginga, and ASCA. ASCA, formerly known as ASTRO-D, is still active.

Instrument Description

ASTRO-E has three main instruments: the X-Ray Spectrometer (XRS), the X-ray Imaging Spectrometer (XIS), and the Hard X-ray Detector (HXD). Japan's Institute of Space and Astronautical Science (ISAS) provides the launch vehicle for ASTRO-E, as well as the spacecraft itself and several components to other detectors. NASA's Goddard Space Flight Center (GSFC), in collaboration with Nagoya University, provides the satellite's five X-Ray Telescopes (XRTs) and, in collaboration with ISAS and Tokyo Metropolitan University, provides the detector for the XRS, the satellite's primary instrument. One XRT funnels x-rays onto the XRS. The other four XRTs are attached to four x-ray-sensitive Charged Coupled Devices (CCDs). Together, the CCDs and telescopes comprise the XIS. The XIS uses CCDs and supporting instrumentation made by the Massachusetts Institute of Technology (MIT). The University of Tokyo provides the HXD.

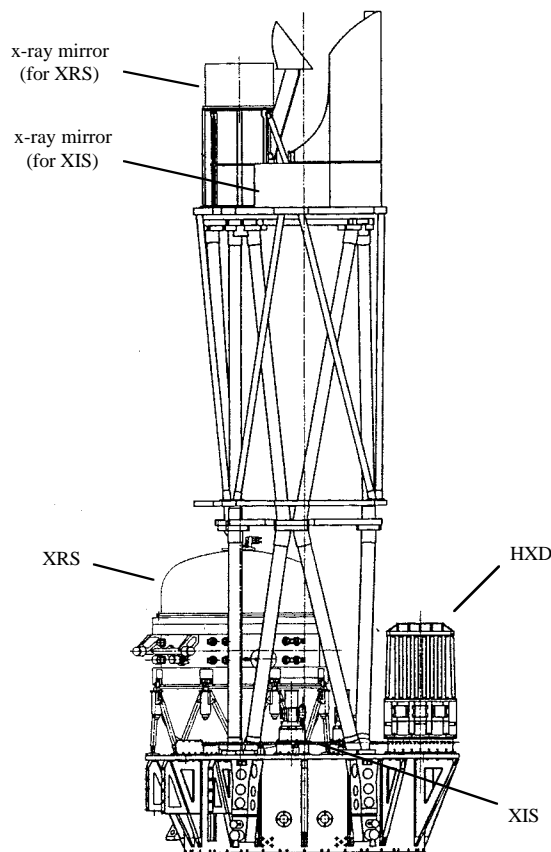
The XRS, a new technology, will for the first time provide both high spectral resolution and high throughput in one instrument. High spectral resolution allows measurements at many different wavelengths and provides much finer detail in the light spectrum. High throughput means the XRS has a large collecting area combined with the ability to measure most of the x-rays that reach the detector, an efficiency crucial for analyzing faint and distant x-ray sources.

The XRS instrument uses microcalorimeter detectors that sense the energies of individual x-ray photons as heat, as opposed to converting x-rays to electrical charges and then collecting that charge, which has been the mechanism in other x-ray detectors. The instrument was developed by NASA GSFC in collaboration with ISAS.

For the XRS to measure the heat produced by a single photon, its microcalorimeter array must be cooled to an extremely low temperature to about -273 degrees Celsius (0.060 degree Kelvin.)

At this temperature, the XRS detector will be the coldest object in space. (The absence of all heat, called absolute zero, is 0.0 degree Kelvin.) The XRS team and their Japanese associates accomplished this by creating a three-stage cooling system capable of maintaining these low temperatures for about two years in orbit -- yet another innovation for the ASTRO-E mission.

The XIS utilizes detectors similar to those flown on ASCA, ASTRO-E's precursor, yet with twice the collection efficiency at certain x-ray wavelengths. The HXD also utilizes a tested yet improved technology. The HXD will extend ASTRO-E's observation ability into the "hard" x-ray wavelengths with the highest sensitivity ever achieved.



Schematic view of the ASTRO-E satellite.

Major Mission Characteristics

Launch Date: mid-late February, 2000

Launch Vehicle: M-V rocket

ISAS/Kagoshima Space Center

Mission Lifetime: approx. 5 years

(2 years for XRS)

Orbit: near Earth circular (~550 km)

Inclination: ~31°

Payload: 1650 kg, 6.5x5.4x2.1m

Energy Range

XRS: 0.4-10 keV

150 cm²@1keV; 150 cm²@6keV

XIS: 0.3-12 keV

300 cm²@1keV; 250 cm²@6keV per camera

HXD: 10-700 keV

230 cm² < 40keV; 330 cm² > 40keV

Mission Team

Japanese Participation

Project Manager: Prof. Yoshiaki Ogawara / ISAS

Mission Scientist: Prof. Hajime Inoue / ISAS

NASA Participation

Project Scientist: Dr. Steven Holt / GSFC

US PI for XRS: Dr. Richard Kelley / GSFC

US PI for XRT: Dr. Peter Serlemitsos / GSFC

Program Executive: Adriana Ocampo / HQ

Program Scientist: Dr. Louis J. Kaluzienski / HQ

Program Manager: Dino Machi / GSFC

Mission Manager: Gustave J. Comey, Jr. / GSFC

For more information on this or any other space mission, visit
<http://spacescience.nasa.gov>